

Application No.: 10/596,710
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Kumar
Serial No. : 10/596,710
Confirmation No. : 9802
Group Art Unit : 3723
Examiner : Alvin J. Grant
Filed : June 22, 2006

Title: Grinding Wheel for Wheel Grinding Application and Method of Roll Grinding Thereof

Commissioner for Patents
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PRE-APPEAL BRIEF REQUEST FOR REVIEW

In response to the final rejection mailed November 25, 2009, Applicants respectfully request a pre-appeal brief request review. This document contains a cover page, three pages of claims and four pages of arguments. Applicants respectfully request a two-month extension of time for response and are filing a Notice of Appeal herewith. The extension of time and Notice of Appeal fees are submitted herewith.

Listing of the Claims begin on page 2 of this paper.

Remarks begin on page 5 of this paper.

LISTING OF THE CLAIMS

1. (Previously presented) A method of grinding a ferrous roll having a rotating roll surface with a rotating grinding wheel, the ferrous roll having a hardness greater than 65 SHC and a minimum diameter of at least 10 inches and a length of at least 2 feet, the method comprising:
 - a) mounting a grinding wheel on a machine spindle and setting the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees;
 - b) bringing the rotating wheel into contact with a rotating roll surface and traversing the wheel across an axial roll length, while maintaining a ratio of axial taper tolerance (TT) to radial wheel wear compensation (WWC) of greater than 10; and
 - c) grinding the roll surface to a surface roughness R_a of less than 5 micrometer while leaving the roll surface substantially free of feed marks, chatter marks, and surface irregularities.
2. (Original) The method of claim 1, wherein the roll is ground to a surface roughness R_a of less than 3 micrometer.
3. (Cancelled).
4. (Original) The method of claim 1, wherein the ferrous roll surface is substantially free of thermal degradation of the roll material.
5. (Original) The method of claim 1, wherein the ratio of TT to WWC is greater than 25.
- 6.-7 (Cancelled).
8. (Original) The method of claim 1, wherein said grinding wheel includes a layer comprising of a superabrasive material having a Knoop hardness greater than 3000 KHN, selected from the group of natural diamond, synthetic diamond, cubic boron nitride, and mixtures thereof, with or without a secondary abrasive with Knoop hardness less than 3000 KHN, in a bond system.

9. (Cancelled).

10. (Previously presented) The method of claim 8, wherein the superabrasive material comprises cubic boron nitride, and the amount of cubic boron nitride in said grinding wheel bond system is in the range of 10 to 60 volume %.

11. (Cancelled).

12. (Original) The method of claim 8, wherein the bond system is one of: a) a vitrified bond comprising at least one of clay, feldspar, lime, borax, soda, glass frit, fritted materials and combinations thereof; and b) a resin bond system comprising at least one of a phenolic resin, epoxy resin, polyimide resin, and mixtures thereof.

13. (Original) The method of claim 1, wherein the grinding wheel is rotated from 3600 to 12000 fpm.

14. (Original) The method of claim 1, wherein said method further comprises the step of removing stock off the ferrous roll in one pass or multiple passes.

15.-17. (Cancelled).

18. (Original) The method of claim 1, wherein the grinding is carried out at a G ratio of at least 20.

19. (Original) The method of claim 1, wherein the grinding wheel has an axis of rotation that is substantially parallel to the rotational axis of the roll.

20. (Original) The method of claim 1, wherein said ferrous roll is a solid revolution having a surface geometry selected from one of: a convex crown, a concave crown, a continuous numerical profile, and a polynomial shape along the axis of the roll, ground to a form profile tolerance of less than 0.05 mm.

21. (Previously presented) The method of claim 1, wherein said grinding wheel has a traverse rate of at least 50 mm/min.

22. (Original) The method of claim 1, wherein said grinding wheel removes a stock grind amount of less than about 0.2 mm from the minimum worn roll diameter.

23-30. (Cancelled).

31. (Previously presented) A method of grinding a ferrous roll having a rotating roll surface with a rotating grinding wheel, the method comprising:

- a) mounting the grinding wheel on a machine spindle;
 - b) bringing the rotating wheel into contact with the rotating roll surface and traversing the wheel across an axial roll length; and
 - c) grinding the roll surface while at least one or both of said grinding wheel rotational speed and said mill roll rotational speed is varied in an amount of +/- 1 to 40% in amplitude, with a period of 1 to 30 seconds;
- wherein a ratio of TT to WWC is greater than 25.

32.-35. (Cancelled)

36. (Previously presented) The method of claim 31, wherein the bond system is one of: a) a vitrified bond comprising at least one of clay, feldspar, lime, borax, soda, glass frit, fritted materials and combinations thereof; and b) a resin bond system comprising at least one of a phenolic resin, epoxy resin, polyimide resin, and mixtures thereof.

37.-40. (Cancelled)

REMARKS

Per the Advisory Office Action mailed February 17, 2010, claims 1, 2, 4, 5, 8, 10, 12-14, 18-22, 31 and 36 stand finally rejected.

1. 103(a) Rejection of Claims 1, 2, 4, 5, 14, 19, 20 and 22 *Henmi et al.* (US 4,989,375) in view of *Sheu et al.* (US 5,025,547)

Claims 1, 2, 4, 5, 14, 19, 20 and 22 stand rejected under 35 U.S.C. § 103(a) over *Henmi et al.* (US 4,989,375) hereinafter *Henmi et al.* in view of *Sheu et al.* (US 5,025,547) hereinafter *Sheu et al.* (see Final Office Action (11/25/2009)). Applicants respectfully submit that neither *Henmi et al.* nor *Henmi et al.* and *Sheu et al.* in combination teach all elements of the claims and thus the combination fails to render any of the claims obvious.

Independent claim 1 and dependent claims 2, 4, 5, 14, 19, 20 and 22 are directed to a method that includes “setting the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees.” Each of these claims also requires “maintaining a ratio of axial taper tolerance (TT) to radial wheel wear compensation (WWC) of greater than 10.”

Page 2, paragraph 3, lines 5-12 of the Final Office Action (11/25/2009), includes the Examiner’s interpretation of the *Henmi et al.* reference. Fig. 7 and Table 1 of *Hemni et al.* fail to teach or suggest Applicants’ claims limitations as suggested by the Examiner. Col. 9, lines 46-64 of *Hemni et al.* describe the placement of the working roll, grinding wheel and the rotation of the grinding wheel (see Figs. 5 and 7).

Applicants respectfully submit that at page 7, paragraphs 1-2 of Applicants’ After Final Response (01/25/2010), the deficiencies in *Henmi et al.* are addressed with regard to the angle between the grinding wheel rotational axis and roll rotational axis. The Examiner has pointed out that Table 1 of *Hemni et al.* teach Applicants’ claim limitations and that the inclination angle of *Hemni et al.* is also defined in *Hemni et al.* at col. 9, lines 50-57 and Fig. 7. In view of this, it is clear that *Hemni et al.* fail to teach or suggest Applicants’ claim limitations with regard to “setting the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees.”

At page 2, paragraph 3, lines 7-12 of the After Final Office Action (11/25/1009), the Examiner states that *Hemni et al.* teach Applicants' claimed ratios, "axial taper tolerance to radial wheel wear compensation" (see Applicants' claims 1 and 5). The Examiner refers to col. 14, lines 47 through col. 15, line 19 and col. 12, line 47 through col. 13 line 17 of *Hemni et al.* and states that *Hemni et al.* teach Applicants' claim limitations at these recited passages.

Applicants define taper tolerance and wheel wear compensation at paragraph 007 of Applicants' specification and in Applicants' After Final Response (1/25/2010) at page 7, paragraph 4. In reading col. 14 line 47 through col. 15, line 19 and col. 12, lines 47 through col. 13 lines 17 and considering Applicants' arguments at page 7, paragraph 5, it is clear that *Henmi et al.* fail to teach or suggest Applicants' claim limitations with regard to axial taper tolerance to radial wheel wear compensation. In these passages, *Hemni et al.* refers to "tapered surfaces" 62,64 (Fig. 10) and not a ratio of axial taper tolerance to radial wheel wear compensation.

The Examiner stated at page 2 of the Final Office Action (11/25/2009) that it would have been obvious to one having ordinary skill in the art at the time that invention was made to have ground *Henmi's* roll to a surface finish less than 3 micrometers as taught by *Sheu et al.* so as to achieve a polished finish. At page 2, the Examiner stated that "*Henmi et al.* does not specifically disclose a surface roughness of less than 5 mircons and that *Sheu et al.* discloses a roll grinding process (Fig. 5) that achieves a surface roughness of less than 3 micrometers so as to achieve a polished finish."

Applicants argue that *Sheu et al.* (at col. 6, lines 23-28) does not teach or suggest "...a surface roughness R_a of less than 5 micrometer" as Applicants' claim. See Fig. 5 of *Sheu et al.* and col. 6, lines 23-28. *Sheu et al.* teach depth of craters "being on the order of 3.0 microns" (*Sheu et al.* col. 6, lines 23-38) and not "a roll grinding process (Fig. 5) that achieves a surface roughness of less than 3 micrometers to as to achieve a polished finish" (Examiner's quotation, page 2, last paragraph to page 3, first paragraph; Final Office Action (11/25/2009)).

Henmi et al. fail to teach or suggest all Applicants' claim limitations as required by MPEP §2143. Further, the combination of *Henmi et al.* in view of *Sheu et al.* fails to teach all elements of those claims, and thus the combination fails to render any of the claims obvious.

Applicants respectfully submit that the 35 U.S.C. §103(a) rejection is improper and Applicants respectfully request withdrawal of the rejections of claims 1, 2, 4, 5, 14, 19, 20 and 22.

2. 103(a) Rejection of claims 8, 10, 12, 13, 18 and 21, 31 and 36

Claims 8, 10, 12, 13, 18 and 21, 31, and 36 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Henmi et al.* in view of *Sheu et al.* and in further view of *Mori et al.* (US 6,306,007) hereinafter *Mori et al.* (see Final Office Action (11/25/2009)).

Pages 3-4 of the Final Office Action (11/25/2009) state the Examiner's reasons for rejecting claims 8, 10, 12, 13, 18 and 21, 31 and 36.

Claims 8, 10, 12, 13, 18 and 21 ultimately depend from independent claim 1 and contain the limitations thereof. As argued above with regard to claim 1, *Henmi et al.* fail to teach or suggest Applicants' claim limitations as required by MPEP § 2143. As such, the combination of *Henmi et al.* in view of *Sheu et al.* and in further view of *Mori et al.* fails to teach all elements of those claims, and thus the combination fails to render claims 8, 10, 12, 13, 18 and 21 obvious.

Independent claim 31 contains the limitation of "...wherein a ratio of TT to WWC is greater than 25."

Claim 36 ultimately depends from claim 31. As argued above with regard to claim 1, Applicants respectfully submit that *Henmi et al.* fails to teach or suggest Applicants' claim limitations as required by MPEP § 2143. As such, the combination of *Henmi et al.* in view of *Sheu et al.* and in further view of *Mori et al.* fails to teach all elements of those claims, and thus the combination fails to render claims 31 and 36 obvious.

The combination of *Henmi et al.* in view of *Sheu et al.* and in further view of *Mori et al.* fails to teach all elements of those claims, and thus the combination fails to render any of the claims obvious.

Applicants respectfully submit that the 35 U.S.C. §103(a) rejection is improper and Applicants respectfully request withdrawal of the rejections of claims 8, 10, 12, 13, 18, 21, 31 and 36.

3. Examiner's Comments in Advisory Action (2/17/2010)

In the Advisory Action, the Examiner stated:

E.g., the positioning of the grinding angle of less than about 25 degrees is is [sic] explained in the Office Action because the spindle is mounted at less than ablost [sic] 25 degrees with respect [sic] with vertical axis which makes the grinding wheel (perpendicularly mounted to the spindle) also less than about 25 degrees.

Applicants do not claim what the Examiner suggests. Applicants claim "...setting the angle between the **grinding wheel rotational axis** and **roll rotational axis** less than about 25 degrees..." (independent claim 1, in part).

Further, the Examiner has failed to address Applicants' arguments (After Final Response (1/25/2010), page 7) regarding taper tolerance (independent claims 1 and 31).

In view of the above arguments, Applicants respectfully submit that claims 1, 2, 4, 5, 8, 10, 12-14, 18-22, 31 and 36 are clearly allowable over the prior art.

CONCLUSION

Based on the arguments presented above, Applicants request withdrawal of the rejections and allowance of all claims. If the Office has any questions or comments or needs any additional information, I invite the Office to telephone me at the number listed below.

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Respectfully submitted,

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